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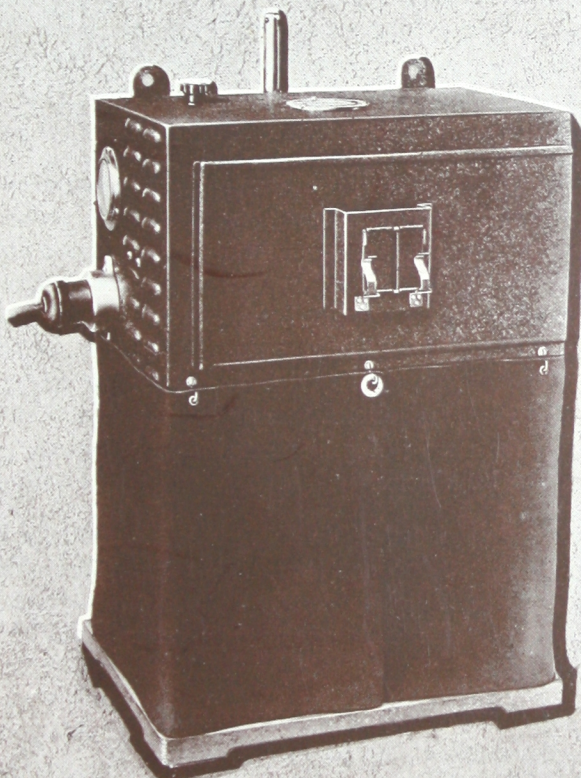
FEB 16 1928



HANOVIA

ULTRAVIOLET LAMPS

AND OTHER EQUIPMENT
FOR LABORATORY USE



ULTRAVIOLET LIGHT

In Scientific Research

ULTRAVIOLET RADIATION and its many applications in chemical research have recently received powerful stimulus. With increasing interest in this portion of the spectrum by the world of science, its properties and applications have become better understood. There is nevertheless a necessity for much more intensive investigation. The utility of light, and particularly ultraviolet light, in various chemical processes has hardly more than become apparent.

Ultraviolet radiation provides the chemist with an uncontaminating catalyst. Organic compounds are specially reactive under its influence. A large number of polymerizations, condensations, photolyses, oxidations and syntheses have been observed. Some of these reactions have become the basis of important industrial processes. The ionization of gases and reproduction of the photoelectric effect on metals introduce many interesting problems for the physicist.

It has been definitely established that ultraviolet light has an important place in photochemistry, spectrometry, polarimetry, interferometry, photomicroscopy, as well as photo-electric and absorption studies. It is applicable to the testing of paints, varnishes, rubber, dyes, inks, paper and textiles. Of recent years, ultraviolet light, as produced by a quartz mercury vapor arc, has been applied as a substitute for sunlight in the leather industry. They have adopted this same apparatus for the irradiation of food stuffs and for the drying, bleaching and deodorizing of oils and fats. Quite recently developments have been noted in its application to the testing of genuineness of precious stones, paintings, pearls, documents and bank notes.

HANOVIA places at the disposal of the scientific world the most highly perfected equipment for the production of intense ultraviolet light. This equipment has been refined to the point where it is adapted to every conceivable purpose wherein ultraviolet light is employed in research.

SCIENTIFIC APPARATUS DIVISION

HANOVIA CHEMICAL & MFG. CO.

CHESTNUT ST. & N. J. R. R. AVE., NEWARK, N. J.

NEW YORK

CHICAGO

SAN FRANCISCO

UNIVERSAL LABORATORY MODEL

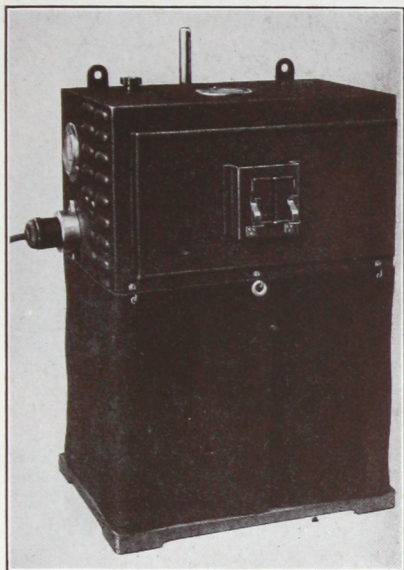


Fig. 1.—The Universal Laboratory Model with stand-base and curtain

The Universal Laboratory Model is an apparatus for the production of intense ultraviolet light for use in general laboratory work. Its design renders it convenient and compact. It retains the efficient and economical quartz mercury arc burner that is employed in other HANOVIA apparatus.

In this new lamp the burner is contained within a sturdy, lightproof case, mounted on a substantial upright and base. The case can be adjusted to any height from the base up to the top of the 20-inch upright. Double wing-nuts are provided in the rear of the case, assuring a fixed, rigid fastening upon the upright.

For general irradiation of some substances or solutions directly in front of the apparatus, the entire front of the case is removable by sliding out. The bottom of the case is also removable and is interchangeable with the front slide.

This lamp unit is especially suited to the use of the smaller standard Wratten filter, and to the Wood's filter. It can also readily accommodate other kinds. Provision is made upon the front slide, as will be seen on reference to the illustrations, for use of a glass or quartz cell (see fig. 7). This cell can be used for filter solutions, or for oils, etc., and for water to absorb heat rays. Both front and bottom slides being interchangeable, it is readily possible to use filters on the bottom of the apparatus, just as they are used on the front.

For use in combination with filter or water cell, or without either, there

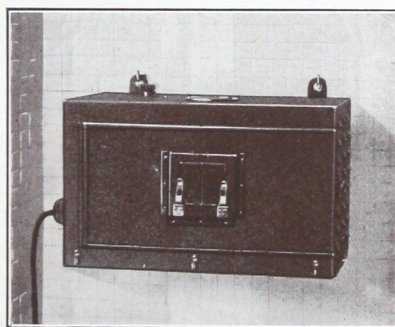


Fig. 2.—Showing suspension on wall dispensing with stand-base. Note combination aperture device and protection slide, held by clips.

HANOVIA QUARTZ MERCURY ARC LAMPS

VARIOUS RADIATIONS with the UNIVERSAL LABORATORY MODEL

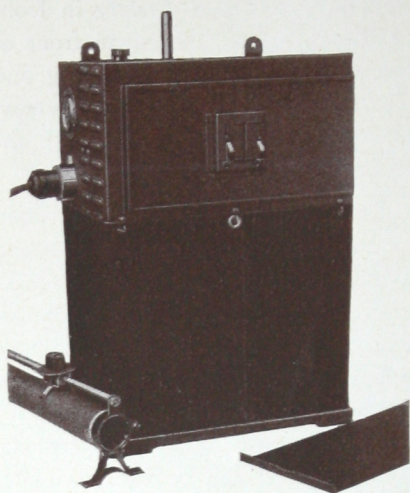


Fig. 3.—Irradiation from below with bottom slide of case removed. Curtain in use for protecting eyes from any reflected light. Note polarity indicator.

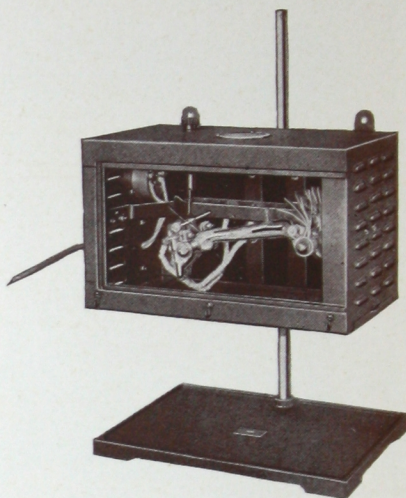


Fig. 4.—Front slide of casing removed for front irradiation without filters.

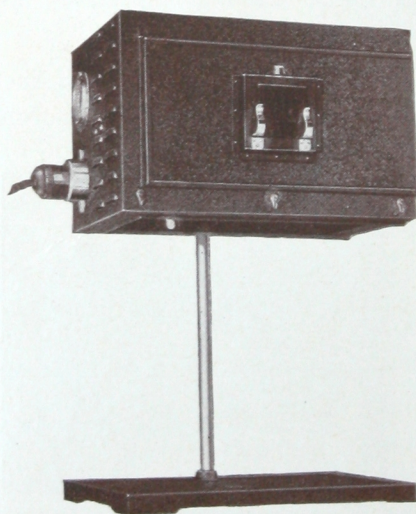


Fig. 5.—Bottom slide removed for irradiating substances on base.



Fig. 6.—Slides interchanged and filter and glass cell employed in bottom slide.

HANOVIA QUARTZ MERCURY ARC LAMPS

is provided an adjustable, vertical aperture device. This device can be adjusted for any vertical slit measuring from approximately $1/64$ inch to 1 inch. The aperture can, of course,

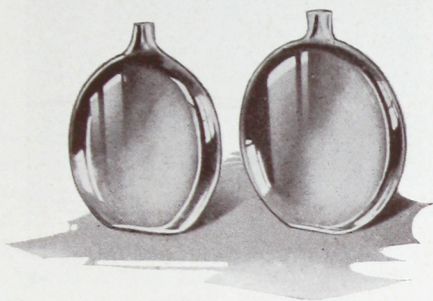


Fig. 7.—Glass and quartz cells (Catalog 2680, glass. Catalog 2681 fused quartz).

be closed completely so that no light is emitted from the lamp.

If it is considered more convenient to have the case of the apparatus permanently fixed upon the wall above the laboratory bench, this can be readily accomplished (see fig. 2).

The direct current Universal Model is furnished with a polarity indicator, a refinement on equipment of this nature that is a safeguard against operating the lamp on wrong polarity. In addition to this it indicates at a glance when the equipment is operating at fullest efficiency.

The Universal Model Lamp is designed and wired so that it may be easily changed from A. C. to D. C. operation, providing another burner is obtained and the transformer is replaced with a rheostat. This adds to the utility of the apparatus. A change

in the electric current available to the user does not necessitate complete replacement of the equipment.

A special filter slide for fluorescent studies is now available. It is known as catalog No. 2683 and is illustrated in fig. 20 herewith. The actual filter area is about 4 in. by 9 in. and the slide upon which it is fastened can be used upon the front or bottom of the Universal Model Lamp case. It provides a most convenient method of obtaining a powerful flood of invisible ultra-violet light. The filter area being quite large, it is not essential to carry out fluorescent studies in a dark room.

When desired, this slide can be obtained in place of the regular front slide shown in fig. 3 at no additional cost. Where the sole use of the appa-

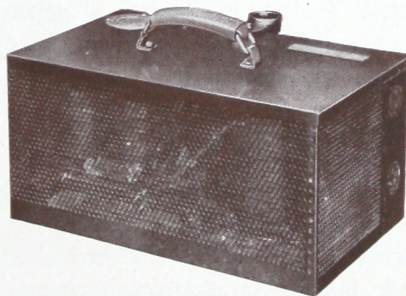


Fig. 8.—Showing portable type of transformer provided with the equipment (cat. 2660, 2670) for A. C. operation.

ratus is fluorescent studies, as in philately or criminology, the slide is a distinct necessity.

A light-proof curtain is provided as shown in Figures 1 and 3. This is at-

HANOVIA QUARTZ MERCURY ARC LAMPS

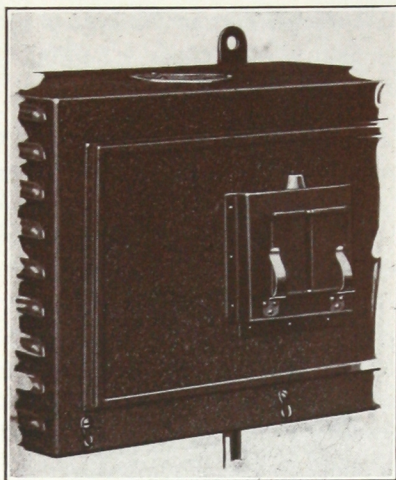


Fig. 9.—View showing efficient method of accommodating a Wratten filter or any other of a similar type. Aperture device shown in use in front of filter. Cell 2680 also indicated in use.

tached very easily and can be used as a means of protection from any reflected light. It also serves the purpose of screening off the base completely into a light-proof chamber wherein various studies of fluorescence can be carried out.

The burner of the Universal Model is of the all-quartz type with ground-in Invar electrodes. A two-electrode burner is provided for direct current operation (Fig. 11) and a three-electrode burner for alternating current

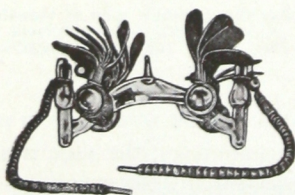


Fig. 11.—Burner employed in D. C. Universal Laboratory Model.

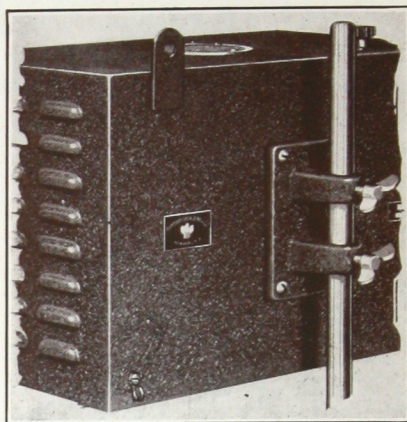


Fig. 10.—Showing double bracket at rear of case. This assures stability of apparatus when in use.

operation. (Fig. 12). The design and construction of this burner is conducive to long life and efficient operation. In addition, the ingenious construction of the Hanovia burner permits repairing of broken or old burners, and thus a great saving is realized by the user.

When the burner has been connected within the case, the complete lamp assembled and electrical connections made, it is only necessary in order to light the burner, to lightly lift and lower the tilting bracket on top of the case until the arc is struck.

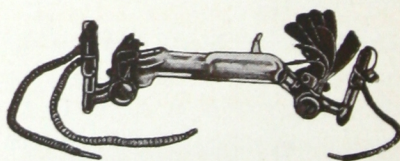


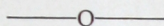
Fig. 12.—Burner employed in A. C. Universal Laboratory Model.

HANOVIA BURNERS

HANOVIA QUARTZ MERCURY ARC LAMPS

LIST OF PRICES

UNIVERSAL LABORATORY MODEL



Cat. No.

Sc. 2640. — The Universal Laboratory Model. Equipment as illustrated in fig. 2, complete with burner, leads, socket attachment, goggles and curtain. With addition of rheostat is ready for immediate operation on 110 volts D. C. Ca. 5 amps., arc 6.5 cm. \$148.00

Sc. 2641.—Slide adjustment rheostat as shown in fig. 3. Necessary for operation of 2640. 14 ohms., 6.5 amps. net \$8.00

Sc. 2642.—Stand base as illustrated in fig. 4. Base has a special black, serviceable finish, upright is nickel plated. Base measures 10 in. x 13 in. Upright measures 20 in. in length. For all lamps, Universal Model. Use of base optional. \$11.50

Sc. 2650. — The Universal Laboratory Model. Equipment as illustrated in fig. 2, complete with burner, leads, socket attachment, goggles and curtain. With addition of rheostat is ready for immediate operation on 220 volts D. C. Ca. 2½ amps., arc 12.5 cm. \$148.00

Sc. 2651.—Slide adjustment rheostat as shown in fig. 3. Necessary for operation of equipment 2650. 28 ohms., 6.5 amps., net \$14.00

Sc. 2652.—Stand base as 2642. \$11.50

Sc. 2660. — The Universal Laboratory Model. Equipment as illustrated in fig. 2, complete with burner, transformer, (see fig. 8) leads, socket attachment, curtains,

goggles, ready for immediate operation on 110 volts A. C. 60 cycles. Ca. 5 amps., arc 12.5 cm. \$285.00

Sc. 2661.—Stand base as 2642. \$11.50

Sc. 2670. — The Universal Laboratory Model. Equipment as illustrated in fig. 2, complete with burner, transformer, (see fig. 8) leads, socket attachment, curtains, goggles, ready for immediate operation on 220 volts A. C. 60 cycles. Ca. 5 amps., arc 12.5 cm. \$285.00

Sc. 2671.—Stand base as 2642. \$11.50

ACCESSORIES

Sc. 2680.—Glass cell for use on front slide of Universal Laboratory Model. Size 7/16 in. x 27/8 in. (See fig. 7) \$1.75

Sc. 2681.—Cell as 2680 in size but of transparent fused quartz. \$21.00

Sc. 2682.—Wood's Filter. 2¼ inches square, ¼ in. thick, polished. ea. \$6.50

Sc. 2683.—Filter Slide for fluorescent studies. Used on lamp case in place of one of regular slides. Filter about 4 in. x 9 in. Transmits a high percentage of invisible ultra-violet rays. \$12.50

(This slide is provided with apparatus to Philatelists and others conducting fluorescent studies at no extra cost, in which case the regular front slide is not included. See figs. 9 and 20.)

THE STANDARD LUXOR MODEL

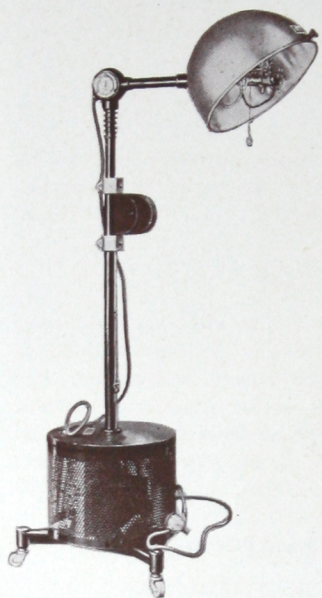


Fig. 13. Standard Luxor Model.

A Floor Stand, mobile type equipment particularly designed for irradiation over large areas. Popular for employment in industrial and college laboratories, veterinary hospitals and zoological gardens.

A mobile source of intense ultraviolet light is desirable in some research work. The Standard Luxor Model can be readily moved from one laboratory to another, being fitted with rubber-tired ball-bearing casters. It is adjustable to any fractional height, having no fixed stops. By means of a compact counterbalance contained within the upright, the hood of the lamp is held rigid at whatever height it may be placed. It is equipped with the standard Hanovia quartz mercury anode type of burner (figures 11 and 12).

Extreme simplicity and sturdiness of construction preclude the possibility of mechanical disorders. Each direct current lamp is equipped with a current direction indicator.

Very compact, the Standard Luxor Lamp occupies a minimum of space. It is easily attached and is available in models for use with either alternating or direct current.

LIST OF PRICES

THE STANDARD LUXOR MODEL

Cat. No.

Sc. 2300.—On stand, complete with rheostat (for direct current) lamp socket attachment plug, leads and two pair of goggles. \$204.00

(Specify voltage when ordering, 110 or 220)

Sc. 2301.—On stand, complete with transformer (for alternating current, 60 cycle operation) lamp socket attachment plug, leads and two pairs of goggles. \$285.00

(Specify voltage when ordering, 110 or 220)

THE PORTABLE LUXOR MODEL

A compact and simple variation of the Standard Luxor Model. Designed essentially for portability.

The upright of this lamp unit is built in two sections, the upper holding the cross arm and the lower containing the counterbalance mechanism. The burner which is of the standard Hanovia type, is locked firmly within the hood when equipment is disassembled and being transported.

The complete unit includes a packing container, which together with the carrying handle on the electrical control case, enables the outfit to be readily carried in two compact sections.

LIST OF PRICES

THE PORTABLE LUXOR MODEL

Cat. No.

Sc. 2302.—Complete lamp as illustrated (for alternating current, 60 cycle operation) with attachment plug, two pairs of goggles and packing container. \$300.00

(Specify voltage when ordering, 110 or 220)

Sc. 2304.—Complete lamp as illustrated with rheostat for direct current operation. Ready for immediate use with attachment plug, two pairs of goggles and packing container. \$218.00

(Specify voltage when ordering, 110 or 220)



Fig. 14. Portable Luxor Model.

THE HANOVIA POULTRY LAMP

A Lamp Unit Designed for Poultry and Livestock Irradiation

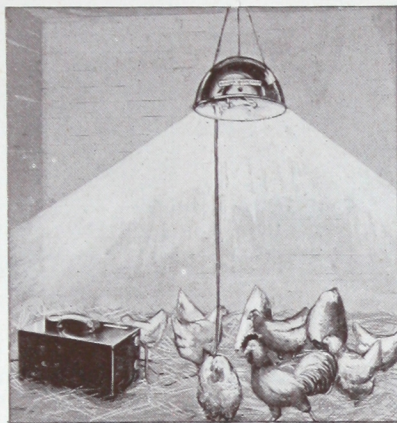


Fig. 15

This ceiling suspension lamp has been designed especially for the irradiation of poultry and livestock. It is a simple, compact and sturdy lamp unit, thoroughly protected against damage while in use.

The source of light is the standard all quartz Hanovia burner as shown in figs. 11 and 12 and is fixed within the hood as illustrated in fig. 13.

With the use of an extra long lead, the hood can be suspended at any

point over a radius of 30 feet without the necessity of changing the location of the transformer or rheostat. When it is necessary to move the equipment from house to house the portable transformer or rheostat is found easy to handle.

Whereas this type of lamp has been designed primarily for practical use on the poultry farm, it has been found exceptionally well suited for research at agricultural experiment stations.

THE HANOVIA POULTRY LAMP

2690.—Poultry lamp for 110 volts direct current operation complete with rheostat, hood, burner, suspension chains, leads, wiring and two pairs of goggles.

Price \$185.00

2691.—Poultry lamp same as 2690 but for 220 volts D. C. operation.

Price \$185.00

2695.—Poultry lamp for 110 volts 60 cycle alternating current operation complete with hood, burner, transformer, leads, wiring, suspension chains, and two pairs of goggles.

Price \$270.00

2696.—Poultry lamp same as 2695 but for 220 volts A.C. operation.

Price \$270.00

THE DESK TYPE LABORATORY MODEL

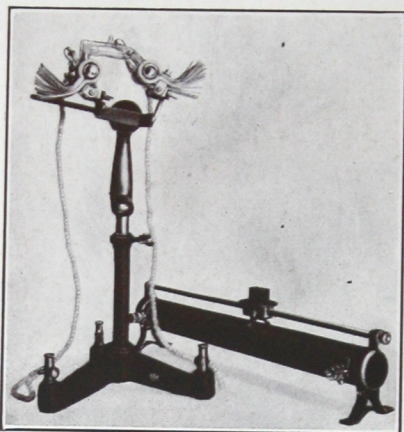


Fig. 16.—Desk Type Model for direct current operation.

The DESK TYPE Laboratory Model (Figs. 16 and 17) is a simple quartz mercury arc apparatus. It employs the regular Hanovia all-quartz burner. A wide range of choice in this particular model is available as will be seen upon reference to the price list on page 9.

The direct current burner (Fig. 16) for use on 110 volts can be operated in either a horizontal or a vertical position. This applies also to the 220 Volt burner. For some work this feature is highly desirable. The A. C. lamp (Fig. 17) can be operated horizontally only.

The lighting of the lamp is effected by tilting the burner slowly so that a stream of mercury flows from anode to cathode, making a short circuit between the two poles. On breaking the stream, the arc is struck and the

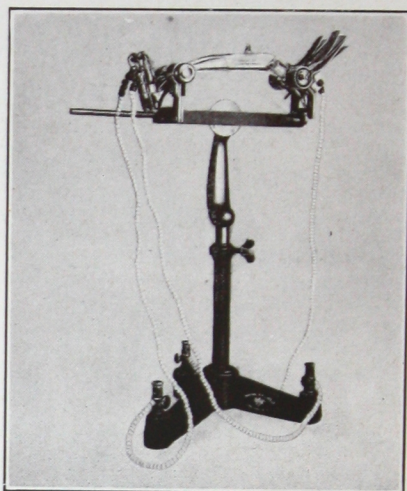


Fig. 17.—Desk Type Model for alternating current operation. Operated with transformer shown in Fig. 8.

lever must be brought back to its original position to allow the mercury to flow into the anode vessel.

At low potentials the arc or electric discharge fills the whole cross-section of the tube. With increasing potential the cross-section of the arc diminishes more and more and forms eventually a thread of approximately 5mm. diameter. The intensity of the light with the lamp in this condition is given for the various types of lamps on the price list.

The specific intensity of the visible and ultraviolet radiation is the same and the economy equally as good in 110 volt as in 220 volt lamps. The absolute constancy of this source of light with constant external conditions is worthy of special note.

HANOVIA QUARTZ MERCURY ARC LAMPS

LIST OF PRICES

DESK TYPE LABORATORY MODEL

FOR DIRECT CURRENT

Sc. 2601—Hanovia Quartz Mercury Arc lamp, for operation on 220 volts D. C. Mounted with tilting frame on tripod, for use on bench or table. Tripod has a vertical adjustment of 6 in. Ca. $3\frac{1}{2}$ amp. 3000 candle power rating in visible light. Arc of burner 12 cm. long. Burner can be operated either horizontally or vertically. The lamp unit and tripod are furnished with all necessary leads, wiring, attachment plug and two pairs of goggles.

Price \$170 00

Sc. 2605—Sliding contact rheostat, 28 ohms, for operation with lamp catalog 2601. See illustration of rheostat as shown with lamp in fig. 16. Price net \$14 00

Sc. 2602—Hanovia Quartz Mercury Arc Lamp for operation on 220 volts direct current. Ca. 2 amp. 1500 candle power rating in visible light. All other details same as Cat. Sc. 2601. Price \$145 00

Sc. 2606—Sliding contact rheostat, 120 ohms, for operation of lamp, catalog 2602. Price net \$8 00

Sc. 2607—Sliding contact rheostat, 25 ohms, for operation of lamp, catalog 2602. Price net \$8 00

Sc. 2603—Hanovia Quartz Mercury Arc Lamp, for operation on 110 volts D. C., mounted with tilting frame on tripod for use on bench or table. Tripod has a vertical adjustment of 6 in. Ca. $3\frac{1}{2}$ amp., 1500 candle power rating in visible light. Arc of burner 7 cm. long. Burner can be operated either horizontally or vertically. The lamp unit and tripod are furnished with all necessary leads, wiring, attachment plug and two pair of goggles. (See fig. 16 D. C. model lamp illustrated).

Price \$145 00

Sc. 2608—Sliding contract rheostat, 25 ohms, for operation with lamp catalog 2603. See illustration of rheostat as shown with lamp in fig. 16. Price net \$8 00

Sc. 2609—Sliding contact rheostat, 14 ohms, for operation with lamp, catalog 2603. Price net \$8 00

Sc. 2604—Hanovia Quartz Mercury Arc Lamp, for operation on 110 volts, D. C., Ca. 2 amps., 800 candle power rating in visible light. Arc of burner 7 cm. long. All other details same as Cat. Sc. 2603.

Price \$130 00

Sc. 2610—Sliding contact rheostat, 50 ohms, for operation with lamp catalog 2604. Price net \$5 50

Sc. 2611—Sliding contact rheostat, 20 ohms, for operation with lamp, catalog 2604. Price net \$5 50

Purchase of rheostat equipment listed is optional, although rheostats of rating mentioned are necessary for operation of the various lamps. As shown, two rheostats of different rating are available with each lamp. One only is required. The rheostat of higher rating is chosen where it is desired to operate the burner at a lower voltage than is possible with the rheostat of smaller rating.

FOR ALTERNATING CURRENT

Cat. No.

Sc. 2620—Hanovia Quartz Mercury Arc Lamp, for operation on 110 volts 60 cycle alternating current, mounted with tilting frame on tripod for use on bench or table. Ca. 5 amp. arc 12.5 cm. long. Burner has a candle power rating of 2,500 in visible light. With leads, socket attachment, wiring and goggles. (See fig. 17, lamp.) Price \$205 00

Sc. 2621—Special transformer used and necessary for operation with lamp No. 2620. Illustrated in fig. 8. Price, \$75 00

Sc. 2630—Hanovia Quartz Mercury Arc Lamp, for operation on 220 volts, 60 cycle alternating current. In all other details same as Cat. Sc. 2620. (Fig. 17.) Price \$205 00

Sc. 2631—Special transformer used and necessary for operation with lamp No. 2630. Illustrated in fig. 8. Price, \$75 00

THE KROMAYER LAMP

Laboratory Model

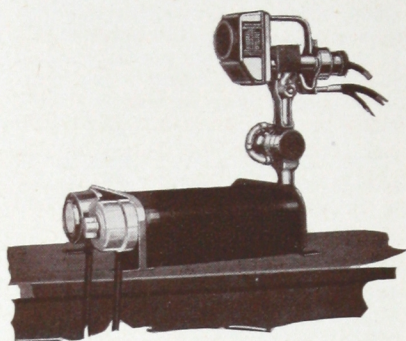


Fig. 18

This is a powerful water-cooled source of intense ultraviolet light. The

water continually circulates through the lamp and serves to filter out those rays of wave length less than 2000 Angstrom units, to whose action on the oxygen molecules, the formation of ozone is due. The water also filters out the infra-red rays. The complete apparatus is well designed, compact and conveniently operated. The burner bracket can be turned in a complete circle and the burner lifted from the bracket and instantly and easily replaced.

PRICE LIST

Sc. 2685.—Kromayer lamp as in figure 18 for direct current operation 110 volts, complete with burner, rheostat, leads, tubing, two pairs of goggles. Price \$248.00

Sc. 2686.—Kromayer lamp as 2685 but for 220 volts D. C. Price \$248.00

Sc. 2687.—Kromayer lamp as in figure 18 but without rheostat, burner with bracket

mounted instead upon a transformer as shown in figure 8. 110 volts, 60 cycle A. C. operation. Complete with leads, tubing, two pairs of goggles, transformer and burner. Price \$324.50

Sc. 2688.—Kromayer lamp as No. 2687 but for 220 volts, 60 cycle A. C. operation. Price \$324.50

PORTABLE WATER CIRCULATING UNIT

A portable, self-contained water circulating unit that is compact, sturdily constructed and conveniently used. It is designed as a medium of circulating water for the Kromayer Lamp or other apparatus requiring an uninterrupted flow of water and for use where running water is not conveniently avail-

able. Electrically operated on A. C. or D. C. A valuable accessory for lecture rooms of schools and colleges, industrial and commercial laboratories.

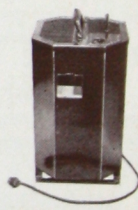


Fig. 19

Price \$118.75

THE QUARTZ MERCURY ARC SPECTRUM

The diagram shown on this page indicates the location of the important lines in the spectrum of the Quartz Lamp. In addition to this characteristic line spectrum, the construction of the Hanovia burner permits of operating conditions that produce a secondary continuous spectrum throughout the ultraviolet to the limits of transmission for Quartz at 1850 A. U. One burner may therefore be made to serve two purposes. At low potentials, it gives the strong line spectrum so useful in microscopy, for certain groups or single lines of the ultraviolet and visible may readily be isolated by means of filters. In like fashion is this spectrum employed for polarimetry. At high potentials, the continuous spectrum with the superimposed line spectrum becomes available for general work, where careful definition of the wave lengths is not required.

ULTRAVIOLET RADIOMETER

Cat. Sc. 2684

Cell for Oxalic Acid-Uranyl sulphate Ultraviolet Radiometer of Anderson and Robinson (Hanovia Bulletin No. 30) \$18.00 each

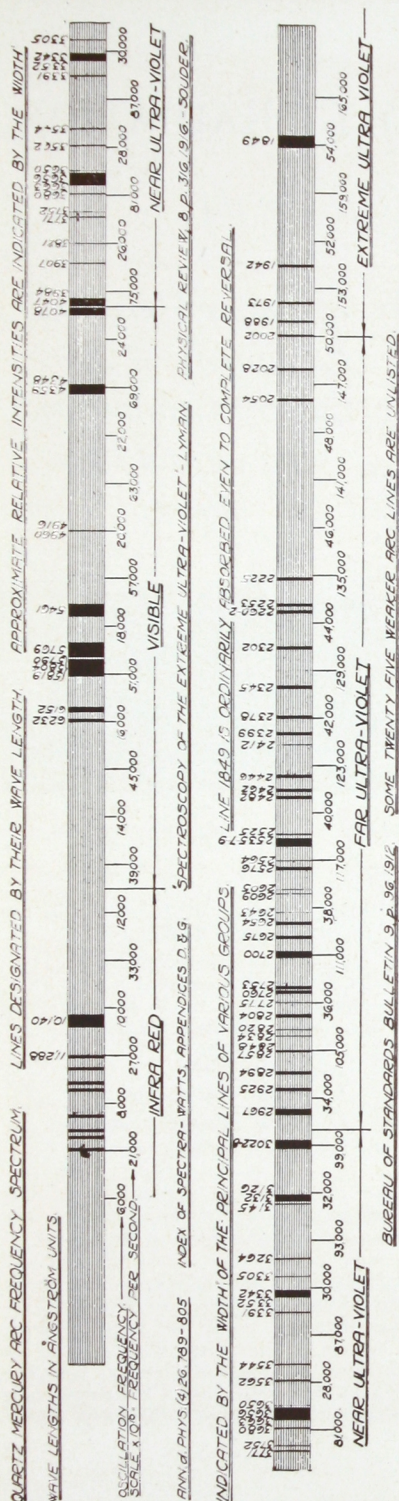
FILTER NO. 25-26

Cat. Sc. 2689

A cylindrical fused quartz cell, gas filled, for transmitting the shorter wave lengths of quartz mercury arc lamps and absorbing the longer wave lengths. Largest percentage of transmission between 2350 Å. U. and 2850 Å. U. 50 mm. dia. 50 mm. long.

\$35.00 each

[Eleven]



INVISIBLE ULTRAVIOLET RADIATION

Some Significant Uses for the

*Hanovia Universal
Laboratory Quartz
Lamp in Conjunction
with certain light
filters.*

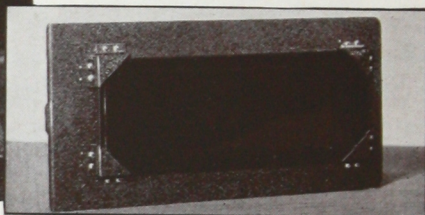
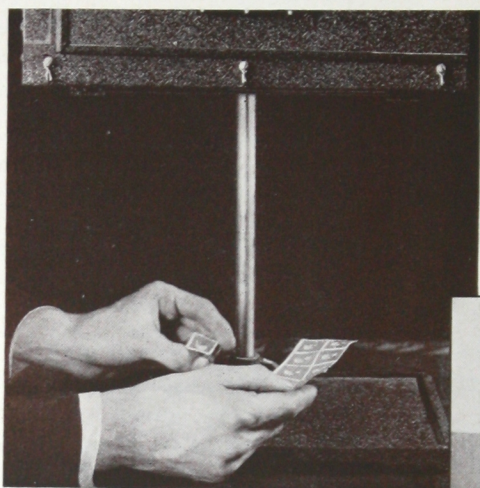


Fig. 20.—Universal Laboratory Model equipped with Filter Sc. 2683, used for testing the genuineness of stamps.

THE radiation emitted by a quartz lamp is in part visible light and part invisible ultraviolet light. To separate an intense beam of invisible light, a special filter is introduced. This filter is of special composition glass and when used with the Universal Model Quartz Lamp absorbs the visible light and permits the passage of the invisible light. These rays which pass through consist largely of the long wave ultraviolet, including a narrow band in the extreme violet, just within the border of visibility. A very intense source of invisible light is thus made possible for some unique and interesting uses.

Invisible ultraviolet radiation as described is widely used for a variety of purposes, as follows:

1. Luminous effects of great beauty are produced on the theatrical stage.
2. Artificial and synthetic gems may be differentiated from the natural stones.

3. Many purposes are found for its use in experimental Pathology.
4. Owing to the characteristic ultra-violet fluorescence of many papers, inks, pigments, etc., fraud or alterations may be readily detected in:

- A. Bank Notes
- B. Legal Documents
- C. Rare Postage Stamps
- D. Oil Paintings, etc.

The effect of the application of this process to a postage stamp is that on any given stamp any addition of matter not of the same composition as the original can be detected by the different fluorescence given off by the materials so differing. This means that if a stamp has been repaired, the repairs (unless made with material of a chemical composition identical with the original) will show up a different color or shade under the rays. Similarly, should

ink pen-marks have been removed from a stamp, even so that their presence cannot be detected under a strong magnifying glass, there is generally enough of the chemical properties of the ink left, where the old marks were, for them to become immediately visible under the rays. These are two most valuable ways in which the lamp may be of great service. There is another, and that is the detection of a re-print or of an actual out-and-out forgery. For this test a specimen of the genuine stamp is needed, then, if the doubtful stamp is placed under the rays alongside the genuine, a fluorescence possibly totally different will be observed unless the paper and ink are of the same composition in both specimens.

Quite recently there has been seen another new development in the use of invisible ultra-violet light as generated by a quartz mercury arc lamp. This development was brought about as a result of a new type of forgery by which a number of important banking institutions were victimized. The frauds were cleverly executed in a most unexpected manner.

Several banking offices were addressed by the forgers with reference to some more or less minor matter, the reply of the bank on its own letterhead then being utilized fraudulently. The forgers washed the original text of the bank letter, leaving only the heading of the letter and signatures, the blank space then being utilized for the forging of a credit letter. This instrument was successfully utilized for quite some time afterward.

Upon discovery, a suitable means of checking these fraudulent credit letters was investigated. It was then learned that the quartz mercury arc lamp when used with a certain type of filter produced a powerful flood of invisible ultra-violet light and was a most excellent means of identifying the frauds. The original text which had been washed off chemically and which was invisible with ordinary means, was immediately detected with the dark invisible ultra-violet light.

5. Criminologists find by its use, perfect finger prints which are quite invisible in daylight.
6. In Archeology old hand writings hidden or scratched out are again made legible.

When the lamp is used in a dark room the filter can be employed upon the front

slide of the lamp and the curtain dispensed with. When the apparatus is lighted a portion of the room appears to be filled with a peculiar, hazy, bluish-white light. This is the result of the fluorescence of the lens of the eye produced by the rays coming directly from the lamp or by reflection from the walls.

Materials dyed with Rhodamin are extraordinarily beautiful. If for instance, strands of wool of different colors are subjected to radiation by the invisible rays, amongst which are some strands dyed with Rhodamin (pink), then the latter will gleam out from amongst the others, like bright red hot wires. In connection with textile fibres, invisible ultra-violet rays are of value in the grading of wools, silks and cottons.

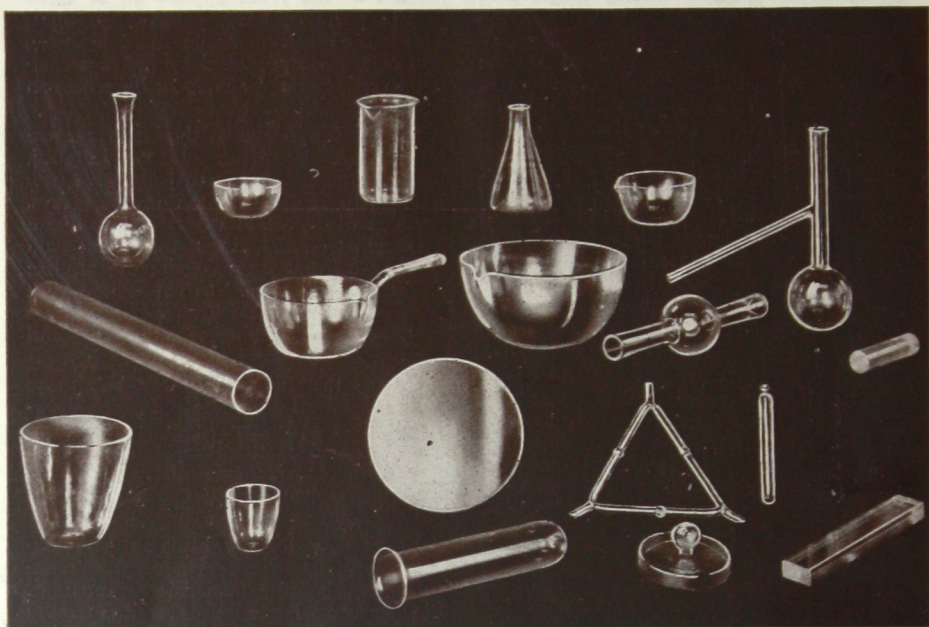
Under the invisible ultra-violet rays many substances are fluorescent, each showing its own characteristic color of fluorescence. Vaseline, Petroleum, Quinine, Salicylic acid, etc., are particularly suited for purposes of demonstration, owing to their intense fluorescence.

When viewed under this lamp, pathological conditions in the skin otherwise unnoticeable, become immediately apparent. Old scars or X-ray burns will especially stand out. Paper fluoresces beautifully in this light.

By observation under ultra-violet light, wool can be clearly distinguished from cotton and silk, and vegetable oil from mineral oil. Casein has a much stronger fluorescence than gelatine or any other protein—even stronger than cellulose. Even with dyed materials, many colors which have a fluorescence can thus be distinguished from other materials of the same color which have no fluorescence. Uranium salts have a very brilliant fluorescence so that even 1/1000 of the salt in solutions can be detected by this test. A grain of borax which has only a trace of oxide is colorless, but has a marked fluorescence. Extraordinary fluorescence and phosphorescence is exhibited by the numerous forms of zinc sulphide and by the double cyanides of the alkali metals with metals of the Platinum group.

Acetone can be clearly detected in alcohol, the fluorescent effect being very perceptible even at a strength of 1%. Quinine, Aesculin and Uranium dyes are also among the substances which have a very bright fluorescence, so that remote traces of these substances can be detected with invisible ultra-violet rays.

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